CLAIMS:

B WE CLAIM

1. A method of imaging a pattern onto a substrate provided with a layer of energy-sensitive material, comprising the steps of:

performing a first exposure to image partly said pattern;

performing a second exposure to image partly said pattern,

wherein at least one of said first and second exposures is performed using an illumination mode having a substantially dipolar intensity distribution.

SUB B8

2. A method according to claim 1, wherein the other of said first and second exposures is performed using an illumination mode having an intensity distribution which is substantially one of: dipolar, quadrupolar, annular and disc-like.

3. A method according to claim 1 ~~or 2~~, wherein a different mask is used to define the image formed by each of said first and second exposures.

SUB B9

4. A method according to claim 3, further comprising the step of exchanging masks between said first and second exposures.

SSUB B5

5. A method according to claim 1 ~~or 2,~~ wherein a mask having at least two sub-patterns is used for the first and second exposures, a first of the said sub-patterns being used to define the image formed by the first exposure and the second of the sub-patterns being used to define the image formed by the second exposure.

SUB B10 A

6. A method according to ^claim 1 ~~any one of the preceding claims~~, wherein the or each dipolar illumination mode is used to image linear features of the pattern oriented substantially perpendicular to the axis joining the respective two poles of the or each dipole mode.

SUB B11

7. A method according to claim 6, wherein the respective mask or mask sub-pattern used with the or each dipolar illumination mode exposure substantially defines only features of the pattern oriented substantially perpendicularly to the axis joining the respective two poles of the or each dipole mode.

SUB B12 A

8. A method according to ^claim 1 ~~any one of the preceding claims~~, wherein the or each dipolar illumination mode intensity distribution comprises two relatively intense poles and further comprises one or more of: a relatively weak central pole; two relatively weak further poles; and a general relatively weak background intensity.

9. A method according to ^claim 1 ~~any one of the preceding claims~~, further comprising the

step of:

changing at least one of the pole radial position, size and intensity between said first and second exposures.

10. A method according to ~~any one of the preceding claims,~~ wherein said first and second exposures are both performed using dipolar illumination modes and wherein the axes of the two dipolar modes are substantially perpendicular to each other.

11. A method according to ~~any one of the preceding claims,~~ wherein the or each of the exposures performed using an illumination mode having a substantially dipolar intensity distribution, is performed using polarized electromagnetic radiation.

12. A method according to claim 11, wherein the polarized radiation is linearly polarized.

13. A method according to claim 12, wherein the radiation is thus polarized so as to have an electric field component oriented substantially perpendicular to the axis joining the respective two poles of the or each dipole intensity distribution.

14. A method according to ~~any~~ of the ~~claims 1-13~~, wherein, between the first and second exposures, the focus of the pattern on the substrate is adjusted, thereby to ensure that both the first and second exposures are performed at substantially optimum focus.

15. A method according to ~~any of the claims 1-14~~, wherein the or each of the exposures using an illumination mode having a substantially dipolar intensity distribution, is performed using an attenuated phase shift mask.

16. A method according to claim 15, wherein the attenuation is thus chosen so as to balance the energy of radiation of the zeroth -and first-order diffracted beams, as they are emerging from said pattern and captured by a projection system used to image the patterns on the substrate.

17. A device manufacturing method comprising the steps of:

providing a substrate which is at least partially covered by a layer of energy-sensitive material;

providing at least one mask for defining a pattern; and

imaging at least part of said mask pattern onto said substrate using a method according to ~~any one of claims 1 to 16.~~

18. A device manufactured in accordance with the method of any one of claims 1 to 17.

19. An apparatus for imaging a pattern onto a substrate provided with a layer of energy sensitive material, said apparatus comprising:

an illumination system for defining first and second illumination modes;

a projection system for imaging parts of said pattern defined by a mask on said substrate; and

a changer for changing between first and second masks;

wherein at least one of said first and second illumination modes is dipolar and wherein said apparatus is arranged to image said pattern by two exposures using respective first and second illumination modes and masks.

20. An apparatus for imaging a pattern onto a substrate provided with a layer of energy sensitive material, said apparatus comprising:

an illumination system for defining first and second illumination modes;

a projection system for imaging parts of said pattern defined by a mask on said substrate; and

means for moving the mask with respect to the projection system, so as to distinctly position first and second mask sub-patterns, located at different positions on the mask, in the radiation beam emerging from the illumination system;

wherein at least one of said first and second illumination modes is dipolar and wherein said apparatus is arranged to image said pattern by two exposures using respective first and second illumination modes and mask sub-patterns.

21. An apparatus according to claim 19 ~~or 20~~, wherein said illumination system comprises at least one ~~or more~~ diffractive optical elements for defining said first and second illumination modes.

SUB B18

ADD B19